



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/924,787	08/08/2001	Sung-Bae Park	SAM-0234	2796

7590

06/18/2003

Steven M. Mills  
MILLS & ONELLO LLP  
Suite 605  
Eleven Beacon Street  
Boston, MA 02108

EXAMINER

LEWIS, MONICA

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 06/18/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/924,787

Applicant(s)

PARK ET AL.

Examiner

Monica Lewis

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 24 March 2003.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) 7 and 8 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 August 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All   b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)                      4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)                      5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 8.                      6) ☐ Other:

### **DETAILED ACTION**

1. This office action is in response to the amendment filed March 24, 2003.

#### ***Response to Arguments***

2. Applicant's arguments with respect to claims 1-6 have been considered but are moot in view of the new ground(s) of rejection.

#### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1 and 4 are rejected under 35 U.S.C. 103(a) as obvious over Applicant's Prior Art Drawings in view of Geissler et al. (U.S. Patent No. 6,245,600) and Hsu et al. (U.S. Patent No. 5,804,858).

In regards to claim 1, Applicant's Prior Art Drawings disclose the following:

- a) a semiconductor substrate (20) (For Example: See Figure 2);
- b) a buried oxide layer (21) formed on the semiconductor substrate (For Example: See Figure 2);
- c) a body (14, 15) on the buried oxide layer, the body being an active region of a transistor (For Example: See Figure 2);
- d) a gate oxide layer (18) formed on a body (For Example: See Figure 2);
- e) a gate (16) formed on the gate oxide layer (For Example: See Figure 2);
- f) an isolation region (11) adjacent to and at least partially surrounding the body (For Example: See Figure 2); and

g) a body contact (12) supplying power to the body (For Example: See Figure 2).

In regards to claim 1, Applicant's Prior Art Drawings fail to disclose the following:

a) a trench that perforates the isolation region, the body, and the buried oxide layer and filling the trench with a conductive material so that the body is electrically connected to the semiconductor substrate.

However, Geissler et al. ("Geissler") discloses a trench filled with conductive material that perforates various layers (For Example: See Figure 5). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Applicant's Prior Art Drawings to include a trench, which is filled with conductive material, that perforates various layers as disclosed in Geissler because it aids in providing an electrical interconnection among the devices.

Additionally, since Applicant's Prior Art Drawings and Geissler are both from the same field of endeavor, the purpose disclosed by Geissler would have been recognized in the pertinent art of Applicant's Prior Art Drawings.

b) a field oxide region formed in the isolation region, the field oxide region at least partially surrounding the body contact.

However, Hsu et al. ("Hsu") discloses field oxide at least partially surrounding a body contact (For Example: See Figure 5). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Applicant's Prior Art Drawings to include field oxide at least partially surrounding a body contact as disclosed in Hsu because it aids in preventing a kink effect in the drain current.

Additionally, since Applicant's Prior Art Drawings and Hsu are both from the same field of endeavor, the purpose disclosed by Hsu would have been recognized in the pertinent art of Applicant's Prior Art Drawings.

Art Unit: 2822

In regards to claim 4, Applicant's Prior Art Drawings disclose the following:

a) a region into which predetermined impurity ions are implanted and generated on the semiconductor substrate in contact with the lower portion of the body contact so that an ohmic contact (110) is formed between the body contact and the semiconductor substrate (For Example: See Figure 3).

5. Claim 2 is rejected under 35 U.S.C. 103(a) as obvious over Applicant's Prior Art Drawings in view of Geissler et al. (U.S. Patent No. 6,245,600), Hsu et al. (U.S. Patent No. 5,804,858) and Adan et al. (U.S. Patent No. 5,841,170).

In regards to claim 2, Applicant's Prior Art Drawings fail to disclose the following:

a) gate is formed of at least one material selected from the group consisting of metal and polysilicon.

However, Adan et al. ("Adan") discloses a gate that is composed of metal or polysilicon (For Example: See Column 10 Lines 9-11). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Applicant's Prior Art Drawings to include a gate composed of a metal or polysilicon as disclosed in Adan because they can withstand high temperature processing without degradation.

Additionally, since Applicant's Prior Art Drawings and Adan are both from the same field of endeavor, the purpose disclosed by Adan would have been recognized in the pertinent art of Applicant's Prior Art Drawings.

6. Claim 3 is rejected under 35 U.S.C. 103(a) as obvious over Applicant's Prior Art Drawings in view of Geissler et al. (U.S. Patent No. 6,245,600), Hsu et al. (U.S. Patent No. 5,804,858) and Hashimoto et al. (U.S. Patent No. 5,475,257).

In regards to claim 3, Applicant's Prior Art Drawings fail to disclose the following:

a) the conductive material formed of one material selected from the group consisting of a metal layer, a tungsten layer, a silicon epitaxial layer, and a combination layer of at least two of a metal layer, a tungsten layer and a silicon epitaxial layer.

However, Hashimoto et al. ("Hashimoto") discloses layers of metal, tungsten and silicon epitaxial (For Example: See Column 3 Lines 18-34). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Applicant's Prior Art Drawings to include layers of metal, tungsten and silicon epitaxial as disclosed in Hashimoto because they aid in increasing the speed of the device.

Additionally, since Applicant's Prior Art Drawings and Hashimoto are both from the same field of endeavor, the purpose disclosed by Hashimoto would have been recognized in the pertinent art of Applicant's Prior Art Drawings.

7. Claim 5 is rejected under 35 U.S.C. 103(a) as obvious over Applicant's Prior Art Drawings in view of Geissler et al. (U.S. Patent No. 6,245,600), Hsu et al. (U.S. Patent No. 5,804,858) and Lynch et al. (U.S. Patent No. 4,646,123).

In regards to claim 5, Applicant's Prior Art Drawings fail to disclose the following:

a) the trench narrows as the trench deepens.

However, Lynch et al. ("Lynch") discloses a trench that narrows as it deepens (For Example: See Figure 3). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Applicant's Prior Art

Drawings to include a trench that narrows as it deepens as disclosed in Lynch because it aids in keeping voids from forming.

Additionally, since Applicant's Prior Art Drawings and Lynch are both from the same field of endeavor, the purpose disclosed by Lynch would have been recognized in the pertinent art of Applicant's Prior Art Drawings.

8. Claim 6 is rejected under 35 U.S.C. 103(a) as obvious over Applicant's Prior Art Drawings in view of Geissler et al. (U.S. Patent No. 6,245,600), Hsu et al. (U.S. Patent No. 5,804,858) and Lynch et al. (U.S. Patent No. 4,646,123) and Abiko et al. (U.S. Patent No. 6,051,472).

In regards to claim 6, Applicant's Prior Art Drawings fail to disclose the following:

a) the trench narrows in a stepwise manner as the trench deepens.

However, Abiko et al. ("Abiko") discloses a trench that narrows in a stepwise manner (For Example: See Figure 17). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Applicant's Prior Art Drawings to include a trench that narrows in a step wise manner as disclosed in Abiko because it aids in keeping voids from forming.

Additionally, since Applicant's Prior Art Drawings and Abiko are both from the same field of endeavor, the purpose disclosed by Abiko would have been recognized in the pertinent art of Applicant's Prior Art Drawings.


***Conclusion***

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 703-305-3743. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 703-308-4905. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722 for regular and after final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ML  
June 4, 2003

  
**AMIR ZARABIAN**  
**SUPERVISORY PATENT EXAMINER**  
**TECHNOLOGY CENTER 2800**